



Tourist responses to climate change: Potential impacts and adaptation in Florida's coastal destinations

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ABSTRACT

Florida, one of the world's most visited tourist destinations, holds one of the most vulnerable positions as a result of climate change. Through a quantitative survey, this study gathered the responses of 432 tourists who had previously visited Florida, with a hypothetical scenario of changed climatic conditions. The examination of the tourist perspective showed the presence of ample sunshine and factors related to beach comfort as the reasons for choosing the destination. In a scenario where beaches disappear and tropical diseases become more widespread, the majority of respondents stated they would choose a different destination. However, respondents would reconsider their intentions if adaptation measures such as reduced prices, coastal habitat conservation and measures to protect beaches from erosion and coastal areas from inundation were in place. The findings suggest that seasonal and geographic shifts in tourism demand could be mitigated by the implementation of adaptation measures at the destination level.

1. Introduction

Some of the most vulnerable areas across the world have already started experiencing the consequences of climate change, with action to deal with them long overdue. The effects of climate change on coastal areas generate severe consequences for the tourism industry. However, despite the high value of tourism properties and economic activities in coastal areas, there remains a paucity of tourism studies related to the impacts of climate change and sea level rise in coastal tourism destinations (Scott, Hall, & Gössling, 2012).

Florida, one of the most visited tourist destinations in the world, holds one of the most 'unenviable' positions in terms of its vulnerability to climate change with the effects already visible, particularly on its coastal areas (Noss, 2011). Climate change and rising sea levels constitute a threat for the sustainability of Florida's coastal resources by increasing the likelihood of flooding, inundation of low-lying lands, saltwater intrusion, and erosion of beaches and barrier islands (Harrington & Walton, 2008). The state's low-lying lands and its economy concentrated in coastal areas make it particularly vulnerable to climate change and sea level rise (SLR). A study by Hauer, Evans, and Mishra (2016) found that previous projections that failed to incorporate population growth in sea level rise impacts hugely underestimated the

number of people at risk and the cost of protecting them. Based on the National Oceanic and Atmospheric Administration's (NOAA) conservative estimate of three feet (about 0.9 m) sea level rise by 2100, 1.2 million people projected to live in Florida's coastal areas are expected to be at risk of flooding from sea level rise (Hauer et al., 2016).

Scott et al. (2012) emphasize the importance of understanding the implications of climate change for tourist demand patterns, and how this constitutes a research priority in the tourism field. As pointed out by De Freitas (2005), the discretionary nature of tourism means that participation will decline as discomfort and dissatisfaction increase. Subsequently, changes in the spatial and temporal features of climate resources will produce significant effects for tourism demand at different levels. That will happen both as a consequence of changing conditions at the destination level and climatic variables perceived as less or more comfortable by visitors (Gössling & Hall, 2006; Gössling, Scott, Hall, Ceron, & Dubois, 2012). In this situation, more insights are necessary into tourists' perceptions in order to understand whether climate change will lead to shifting tourism demand. This is particularly relevant for destinations that are already warm, like Florida. If the perception of what is already perceived as a 'warm' destination changes to 'too warm', then it is when travel flows might suddenly change (Gössling & Hall, 2006). A favorable climate and appealing waterfront

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are main attractions that draw tourists to Florida. The increase of storms, hurricanes and sea level rise in Florida's coastal areas has the power to cause long-term economic impacts to the state's tourism industry and to its attractiveness as a tourism destination (Repetto, 2012).

In spite of the negative consequences of climate change impacts on coastal destinations, timing and effective adaptation and mitigation are vital in determining the extent of climate change impacts (Borisova, Breuer, & Carriker, 2008). Adaptation can be defined as “those actions or activities that people undertake, individually or collectively, to accommodate, cope with, or benefit from, the effects of climate change, including changes in climate variability and extremes” (Becken & Hay, 2007, p. 225). In Florida, with nearly 10% of its land area lying at less than 1 m above sea level, adaptation is especially critical (Noss, 2011). Locally, communities across Florida are developing action plans, investing in storm water pumps, upgrading storm water and sewer systems, and revising building codes. However, these expensive measures to protect homes, businesses, and infrastructure will only serve as a temporary expedient unless climate change is addressed at a wider level (Florida Majors, 2016). Jopp, DeLacy, and Mair (2010) stressed the fact that since the final decision whether to travel to a destination or not is made by individual tourists, tourists are key stakeholders in any adaptation process. Therefore, it is essential to consider and understand their attitudes towards proposed adaptation options and how different adaptation options may affect the appeal of the destination for the tourists.

Despite the urgency for tourism destinations to adapt to climate change, to date, no studies have examined which adaptation measures can prevent a reduction in tourism demand from the viewpoint of the tourists. In an attempt to fill this gap, this study presents the responses, in terms of preferences and visitation intentions, of tourists who have previously visited Florida. The aim of this study is to examine how projected climate change impacts could affect tourism visitation in Florida, and how potential seasonal and geographical shifts in demand could be mitigated through the implementation of adaptation measures at the destination level.

2. Literature review

2.1. Climate change and coastal destinations: impacts and adaptation

Sea level rise is a crucial phenomenon associated to climate change. Over the 21st Century, the global mean sea level will very likely continue to rise due to increased ocean warming and loss of mass from glaciers and ice sheets (Hartmann et al., 2013). While the exact magnitude of global sea level rise and regional variability remains uncertain, sea level rise is considered to be one of the most certain consequences of anthropogenic climate change (Hartmann et al., 2013). The impacts of rising sea levels, especially when combined with changes in storm frequency and intensity, lead to damage of sea defenses, protective mangrove swamps and shoreline buildings, cause beach erosion and create storm-surge damage to coral reefs (Mather, Viner, & Todd, 2005). Additionally, the impacts of sea level rise on coastal areas include phenomena such as erosion, inundation, impeded drainage and increased risk of riverine flooding, salinity intrusion into freshwater supplies, coastal habitat loss through the process of ‘coastal squeeze’ (see Pontee, 2013; Schleupner, 2008), and higher water tables that can negatively affect the stability of foundations of coastal infrastructure (Scott et al., 2012). A particularly challenging phenomenon is the process of coastal squeeze, defined by Pontee (2013), as “one form of coastal habitat loss, where intertidal habitat is lost due to the high water mark being fixed by a defense or structure (i.e. the high water mark residing against a hard structure such as a sea wall) and the low water mark migrating landwards in response to SLR” (p. 206). In the presence of tourism infrastructure, and in addition to habitat loss, the process of coastal squeeze causes a reduction of the beach area available to tourists for leisure purposes.

A number of studies have identified the potential consequences of sea level rise for coastal tourism (such as loss of high-value beaches, destruction of tourism infrastructure and coastal eco-system with loss of biodiversity, increased need for engineering shore protection, changed coastal aesthetics) (e.g. Jones & Phillips, 2009; Phillips & Jones, 2006) and the need for coastal tourism destinations to focus on coastal zone management and planning (e.g. Moreno & Becken, 2009). Other studies have analyzed the impact of sea level rise on tourism infrastructure and coastal resources at the country and state level (e.g. El-Raey et al., 1999; Francia & Juhasz, 1993; Schleupner, 2008; Scott et al., 2012). The largest study conducted on the impacts of sea level rise on tourism analyzed the effects of potential inundation and erosion for major coastal tourism resorts and resort-front beach areas in 19 Caribbean nations (Scott et al., 2012). The study used a geo-referenced database of over 906 major tourism resort properties and estimated that 266 of them would be vulnerable to partial or full inundation by 1-m sea level rise. Such impacts would transform coastal tourism in a region where tourism represents the basis of the economy, with important consequences in terms of both property values and insurance costs, and destination competitiveness and marketing.

The above-mentioned studies have one important limitation. A common critique of engineering and geometric-based sea level rise studies is that they represent potential impacts without considering the extent to which damage could be offset through adaptation, including coastal protection measures (Scott et al., 2012). As argued by Scott et al. (2012), “history teaches us that societies will not sit idly by and watch high-value land, infrastructure and cultural assets be swallowed by the sea” (p.222). Adaptation includes both anticipatory (taken before impacts are observed) and reactive (after impacts have occurred) actions.

Potential impacts of sea level rise, such as land loss and infrastructure damage could be partially prevented through extensive coastal protection (Nicholls et al., 2011). However, Scott et al. (2012) noted that typical coastal protection schemes do not match the key objectives of coastal resorts, which aim at providing unobstructed views of the sea, maintaining unobstructed access to the beach and sea, and the visual perception of an unspoiled beach environment. Additionally, Scott et al. (2012) argued that, while structural protection can easily be designed to protect resort buildings, coastal squeeze will cause the resort to lose its beach unless it is also willing to invest heavily in beach nourishment to make up for the loss. Therefore, some tourism sector assets, such as airports and cruise-ship terminals, and cities that function as important tourism destination, will certainly benefit from structural protection. The same is not so straightforward for coastal resorts, though, which must maintain sufficient beach area and aesthetics to continue attracting tourism clientele (Scott et al., 2012).

It has been noted, however, that adaptation to current climate cannot be interpreted as adaptation to future climate change. In fact, as suggested by Scott et al. (2012), current adaptation initiatives are not necessarily capable of dealing effectively with anticipated future climatic changes projected by climate models. A rise in sea level means that not only protection is needed for the coastline itself, but measures may also be required to protect the hinterland from flooding.

2.2. Tourists' preference for weather and climate conditions in coastal destinations and responses to climate change impacts

Climate is one of the main factors in affecting travel motivations and destination choice (Scott et al., 2012). As such, the implications of climate change for tourist behavior and demand patterns are significant. In this regard, Gössling et al. (2012) argue that “understanding tourist perceptions and reactions to the impacts of climate change is therefore essential to anticipating the potential geographic and seasonal shifts in tourism demand, changes in specific tourism markets, and the overall competitiveness of businesses and destinations” (p. 37). However, as emerged from previous studies (Gössling & Hall, 2006; Gössling

& Hall, 2006a), despite the importance of demand response to climate change, a knowledge gap still exists in this regard. Climate is a key factor considered by tourists, either consciously or subconsciously, during travel planning (Scott, Gössling, & De Freitas, 2008). It is recognized that tourism is influenced by weather and climate, with ‘sun, sand and sea’ holiday decisions being predominantly based on perceptions of warm and sunny environments (Gössling & Hall, 2006). Numerous beach tourism destinations depend on favorable climatic conditions, such as abundant sunshine and absence of precipitation or wind (Scott et al., 2008). In general, a crucial element in leisure travel demand is the degree of comfort (or discomfort) experienced at the tourism destination (Mather et al., 2005). The comfort experienced by tourists is also influenced by other elements such as disease risk, prolonged rainfall and changes in extremes. All these factors affect leisure travelers' destination choice (Mather et al., 2005).

Several studies have examined tourists' preference for weather and climate conditions. Although both climate and weather are extremely important when it comes to tourism considerations and they have been the object of numerous research studies, the two terms should not be used interchangeably. On the one hand, weather is what tourists actually experience when visiting a destination. On the other hand, climate is what tourists would expect to experience at a destination, whereas, once on site, they can find a weather that does not match their climatic expectations (Scott et al., 2008). Weather can be defined as the “state of the atmosphere at a moment in time, as determined by the simultaneous occurrence of several meteorological variables (temperature, wind, cloud cover, precipitation) at a specific geographical location” (Scott et al., 2008, p. 45). Climate, on the other hand, is “the state of the climate system, including a statistical description in terms of the mean and variability of meteorological variables over a specified period of time” (Scott et al., 2008, p. 45).

The different approaches to analyzing climate preferences of tourists and defining optimal or unacceptable weather and climate conditions can be grouped into three types: expert-based (e.g. Becker, 2000; Gómez-Martín, 2004), revealed preferences (e.g. Bigano, Hamilton, & Tol, 2006; Lise & Tol, 2002; Maddison, 2001), and stated preferences (e.g. De Freitas, 1990; Morgan et al., 2000; Rutty & Scott, 2010; Scott et al., 2008). The stated preferences approach utilizes a direct consultative approach, in which tourists are asked to express their perceived ideal weather conditions and thresholds of what they consider to be poor or unacceptable conditions. To date, only a limited number of studies have consulted tourists about their weather and climate preferences for coastal tourism destination (De Freitas, 1990; Gómez-Martín, 2006; Mansfeld, Freundlich, & Kutiel, 2007; Morgan et al., 2000; Rutty & Scott, 2010; Rutty & Scott, 2013; Rutty & Scott, 2016; Scott et al., 2008).

Although weather and climate conditions themselves have an important influence in tourist demand and behavior, it is the full impact of climate change on tourism environments that tourists will respond to (Scott et al., 2012). Tourists' perceptions of environmental change caused by climate change will be extremely important for destinations where nature-based tourism is a major tourism segment and where ecosystems are extremely sensitive to climatic changes (Gössling et al., 2012; Scott et al., 2008). As Prideaux, Coghlan, and McNamara (2010) pointed out, climate change will force a transformation of how tourists perceive landscapes, especially in sensitive destination types such as beaches and coral reefs.

Another branch of publications on climate change concentrated on tourists and their responses to changing climatic variables. In particular, the effects of increasing temperatures and related parameters on destination choice and time of departure have been the focus of previous research (Gössling & Hall, 2006). One part of this literature stream has used databases and statistics-based models to predict tourist flows and behavior of tourists under a scenario of climate change (e.g. Lise & Tol, 2002; Maddison, 2001). However, such a top-down approach does not take into account the perceptions of the tourists

themselves. As pointed out by Gössling and Hall (2006), a tourist is not likely capable of interpreting a 1 °C temperature increase in terms of comfort, especially without knowledge of other parameters such as humidity or wind-speed. Therefore, perceptions are what are expected to play the most important role in tourists' decision making. On the other hand, other studies provide a bottom-up approach that gathers the perspectives of tourists (Gössling, Bredberg, Randow, Sandström, & Svensson, 2006; Moreno, 2010). For example, Moreno (2010) surveyed Dutch and Belgian tourists who were waiting for their flight to the Mediterranean for a beach vacation. Respondents were asked to rate the relative importance of a list of potential impacts of climate change (i.e. risk of disease, forest fires, water restrictions in hotel, reduced beach extension, heat-wave), and the anticipated consequences of climate change for the destination they chose. In another study, Gössling et al. (2006) interviewed tourists visiting Zanzibar (Tanzania) to assess how they perceived climate change and the possible effects of climate change on travel decisions.

Although it is recognized that coastal tourism is one of the largest tourism segments globally, and that a large proportion of the monitored beaches worldwide are eroding and will be increasingly vulnerable to sea level rise, relatively few studies have examined specifically the potential impact of beach loss on tourism demand (Scott et al., 2012). In particular, only a few studies have been conducted to date from the consumer perspective (i.e. Braun et al., 1999; Uyarra et al., 2005; Buzinde, Manuel-Navarrete, Yoo, & Morais, 2010). For example, Uyarra et al. (2005) asked tourists to rate the relative importance of 16 environmental attributes in choosing Bonaire and Barbados islands as tourism destinations. The study found that the willingness of tourists to repeat their visit to the islands was highly connected to the conditions of their favorite environmental attributes (e.g. marine wildlife such as coral, and beach characteristics).

However, adaptation measures can help mitigate the negative effects of climate change on the appearance and appeal of the destination. For example, a qualitative study conducted by Buzinde et al. (2010) examined tourists' perception of beach erosion and replenishment in Playacar, Riviera Maya. At the time of the study, the shoreline drastically receded because of the impact of two major hurricanes. Some of the tourists interviewed, although finding the appearance of the beach aesthetically unpleasant, regarded the beach restoration efforts as something that will become the norm given climate change impacts, and viewed their presence there as an economical contribution to the destination's conservation effort. These findings show how the attractiveness of the destination examined has been or will be negatively affected in the eyes of the tourists, under a changed climate. On the other hand, they show that adaptation measures implemented by the destination may help when tourists are informed about how such strategies may benefit the destination and ultimately their experience.

Adaptation measures are not always sufficient, however, to appeal to tourists in the occurrence of climate change impacts. For example, Braun et al. (1999) investigated the likelihood of choosing the North German coast as a vacation destination given the effect of temperature and precipitation changes with sea level rise and beach loss. They found that, in case of negative climate change impacts, the likelihood of visiting the destination was substantially lower, even in the scenario where adaptation measures were included. These findings support the point that, of all the stakeholders involved in the tourism system, it is the tourist that has the greatest capacity to adapt to the impacts of climate change. In fact, tourists have three resources – money, knowledge, and time – which give them relative ease and freedom to avoid unfavorable climatic conditions and destinations impacted by climate change as well as the opportunity to change the timing of their trip to avoid unfavorable weather conditions (Becken & Hay, 2012). Therefore, consulting tourists about their perceptions, not only regarding weather and climate conditions and changes, but also about which adaptation measures would make them still feel comfortable in spite of climate change impacts, will be fundamental for mitigating potential

shifts in tourism demand.

Jopp et al. (2010) suggest that tourists' opinions can be obtained by surveying tourists at destination 'hot spots' or by conducting focus groups. The information sought should allow the determination of which adaptation strategies tourists consider important and/or viable, and why. On the other side, as Scott et al. (2008) highlighted, the flexibility that tourists have to change their travel plans is challenging for businesses and destinations that are greatly dependent on tourism. The large investments in immobile infrastructure of businesses such as hotels and other tourism facilities do not allow them to adapt with the same ease to variable climatic conditions. Consequently, by changing the duration and quality of climate-sensitive tourism seasons, climate change will affect the temporal and spatial distribution of tourism flows and spending at a national and international level (Rutty & Scott, 2016).

2.3. Hypothesis development

The purpose of this study is to examine whether the introduction of adaptation measures could mitigate the potential seasonal and geographical shifts in demand produced by the impacts of climate change on Florida's coastal destinations. This study hypothesizes that, if adaptation measures exist at a climate-impacted destination and are made visible to tourists, tourists would be more likely to revisit the same destination, in comparison to a future in which no adaptation is implemented.

H1. There is a relationship between tourists' visitation intentions to a destination and the existence of adaptation measures at the destination.

This study is the first quantitative study of tourist preferences for adaptation measures at a destination level. Relatively few studies that have directly assessed tourist responses to climate change impacts on coastal destinations (Braun et al., 1999; Buzinde et al., 2010; Coombes & Jones, 2010; Gössling et al., 2006; Moreno, 2010; Uyarra et al., 2005). However, none of these consulted tourists to assess which adaptation measures would make them consider not to switch place and time of visitation in spite of climate change impacts if such measures were implemented. By testing the postulated hypothesis, this research attempted to fill the relative gap in the literature and to make a contribution to the relationship between tourism and climate change body of knowledge.

3. Materials and methods

3.1. Research design

By gathering the viewpoint of the visitors, this study contributes to the stream of stated preferences studies analyzing weather and climate preferences of tourists and defining optimal or unacceptable conditions. There are two different climate or weather circumstances to which the tourist may react and that in turn will affect decisions. The first one is based on the climate conditions anticipated by the tourist based on the image of the destination and on weather forecasts; the second one is based on the actual weather conditions experienced on-site. Accordingly, two categories of methods have been used in the literature for collecting data on tourist response to climatic conditions. The first one involves assessing conditional behavior through the use, for instance, of questionnaires and images (*ex-situ*) (e.g. Moreno, 2010; Rutty & Scott, 2010; Scott et al., 2008) in order to understand how people react or think. The second method involves examining on-site experience (*in-situ*) (e.g. Coombes & Jones, 2010; Gössling et al., 2006; Rutty & Scott, 2013; Uyarra et al., 2005). Although *in-situ* studies are extremely valuable to gather tourist responses, they have the potential limitation of being influenced by the weather conditions experienced on-site at the time of the data collection. Therefore, this research took an *ex-situ* approach in order to avoid potential bias from existing

weather conditions at the destination. The study adopted a cross-sectional approach, in part descriptive, and in part relational design.

The fact that climate change is a slow pace phenomenon that is not yet fully visible in most parts of the world, is deep-rooted in climate change science and cannot be overcome easily. Also, although it has been projected that climate change impacts will cause a shift in time and place of tourist visitation, these shifts in tourism demand will occur when actual impacts slowly become evident. Subsequently, trying to predict tourists' actual behavior for a future in which the effects on climate change will be fully visible can only be a tentative effort and is not necessarily accurate. Scenarios are useful tools to ask tourists to imagine what their likely reactions would be in the event of climate change impacts on a visited destinations' environmental features that attract them the most, such as wide beaches and marine wildlife. However, in this situation of uncertainty, researchers can only get partial understanding of how tourists' intentions will translate into actual behavior, once climate change impacts will become evident. This study presents the perspective of tourists who have previously visited Florida, in a hypothetical scenario of changed climatic conditions. Although the data collected in this research are based on tourist-stated preferences and intentions that will not necessarily translate in actual behavior, the existence of a relationship between visitation intentions and the existence of adaptation measures at the destination is investigated.

3.2. Sampling method

The unit of analysis studied in this research was the individual tourist. Since this study aimed to describe the population that comprises those individual tourists, the population of interest for this research was tourists who had previously visited a coastal destination in Florida. The participants in this research were selected through a nonprobability sampling method. Specifically, an accidental or convenience sampling technique was employed, a type of sampling that is based on the availability of subjects to participate in the study. Respondents participated voluntarily, and the instrument was designed to do no harm to respondents who volunteered to participate in the study. Confidentiality and anonymity were secured to protect respondents' identity.

3.3. Instruments - web survey

The data collection method used in this study was a web survey – specifically a self-administered questionnaire. Web surveys have become a largely utilized data collection tool, especially for their advantage of reaching a very large audience inexpensively with rapid response (Cook, Heath, & Thompson, 2000). However, web surveys are not free from potential biases. For instance, they can be subject to a “non-observation error”, since people that could be part of the sample may not have access to the web. Overall, the advantages for selecting a web survey, in this study, are that web surveys are more affordable and easier to administrate when compared to other forms of surveys. In addition, as they are self-administered there is no need for any staff or facilities to conduct the study. Web surveys also provide access to dispersed samples around the globe, and entail high privacy so that the respondent will be less likely to give responses based on social desirability.

3.4. Questionnaire structure

The decision of the variables to measure was heavily influenced by the existing literature relating to tourist's stated preferences for climatic and environmental conditions and to tourists' responses to climate change impacts in beach/coastal destinations. The survey instrument was comprised of six sections. The first section was intended to gather preliminary information about respondents' last beach/coastal

destination visited in Florida. Subsequently, the second section investigated the relative importance of 16 climatic and environmental features for tourists to select the destination. Respondents were asked to use a 7-point Likert scale (1 = extremely unimportant, 2 = very unimportant, 3 = unimportant, 4 = neither unimportant nor important, 5 = important, 6 = very important, 7 = extremely important) to indicate how important the attributes were in selecting Florida as a holiday destination. The attributes considered were derived mostly from Uyarra et al. (2005), Moreno (2010) and Simpson, Scott, and Trotz (2011). In turn, the attributes were purposely adapted to reflect climatic and environmental features typical of Florida's coastal destinations and likely, at the same time, to be influenced by climate change and associated sea level rise.

The third section of the questionnaire was intended to assess tourists' stated preferences for weather and climate conditions. This section of the survey was built on previous work by Scott et al. (2008), Rutty and Scott (2010, 2013, 2016). Four different weather variables were examined (sunshine, temperature, rain and wind), following the abovementioned studies. For assessing tourist's comfort thresholds regarding each of the four weather variables, three classifications were identified: ideal, tolerable and unacceptable, all measured on matching scales. First, tourists were asked to indicate their ideal, tolerably hot and unacceptably hot temperature for a beach/coastal vacation on a continuous scale ranging from 50 °F (10 °C) to 120 °F (49 °C). Secondly, they were asked to indicate their ideal, tolerable and unacceptable daily rain conditions for the same vacation on a continuous categorical scale ranging from 0 to 7, to which the labels "no rain", "1 h", "2 h", "3 h", "4 h", "5 h" and "> 5 h" were attached to help respondents make sense of the scale. Next, respondents were asked to select their ideal, tolerable and unacceptable sky conditions for their beach/coastal destination in Florida in terms of cloud cover in a continuous scale ranging from 0 to 100, to which the labels "0%", "25%", "50%", "75%" and "100%" were attached to help respondents understanding the scale. Lastly, for the variable wind conditions, respondents were asked to select their ideal, tolerable and unacceptable wind conditions for the same vacation in terms of mph on a continuous scale ranging from 0 to 63 mph (0–101 km/h), to which the labels "No wind = 0 mph (0 km/h)", "Light breeze = 1–7 mph (1–11 km/h)", "Moderate wind = 8–17 mph (12–27 km/h)", "Strong wind = 18–30 mph (28–48 km/h)", "Very strong wind = 31–54 mph (49–87 km/h)", and "Storm = 55–63 mph (88–101 km/h)" were attached to facilitate respondents' understanding of the scale provided.

The fourth section of the questionnaire aimed at investigating tourists' responses to climate change impacts in Florida's coastal destinations in terms of visitation intentions. In order to assess their responses without mentioning the concept of climate change and thus trying to avoid any answer biased by their attitude towards the climate change debate, the question was worded as follows: "Keeping in mind the last beach/coastal destination you visited in Florida, please state your likely reaction assuming that the following changes in climatic and environmental conditions were to happen". Hence, ten items were listed, corresponding to ten predicted impacts of climate change on Florida's coastal destinations adapted by the work of Uyarra et al. (2005), Moreno (2010), Scott et al. (2008) and Rutty and Scott (2010). These impacts reflect specific climate change in Florida's coastal areas as projected by the IPCC and reflected in the work of Stanton and Ackerman (2007) and Repetto (2012). For each of the items, tourists were asked to indicate their likely responses in terms of visitation intentions on a categorical scale, adapted by the work of Moreno (2010) and ranging between "I would choose the same destination", "I would choose the same destination but different dates", and "I would choose a different destination".

The fifth section of the questionnaire was aimed at assessing tourists' preferences for adaptation measures. 14 possible adaptation measures were derived from a thorough review of the literature about adaptation measures applicable to coastal destinations (Becken, 2004;

Braun et al., 1999; Mather et al., 2005) and adapted to include some of the adaptation measures that are currently implemented by some Florida's beach/coastal destinations to mitigate the negative impacts of climate change. Tourists were asked the following question: "Please rate the level of desirability of the following options for you to feel comfortable enough to visit the same destination in Florida again, in case of changed climatic and environmental conditions". Each of the 14 items was rated on a 7-point Likert scale of desirability (1 = Extremely undesirable, 2 = Very undesirable, 3 = Undesirable, 4 = Neither undesirable nor desirable, 5 = Desirable, 6 = Very desirable, 7 = Extremely desirable). Ultimately, the sixth section of the survey was intended to gather information about demographic characteristics of tourists such as age, gender, family organization, education level, ethnicity, country of residence, income, political orientation and religious orientation. The final version of the instrument was reviewed by the authors and peers to achieve face validity before being pilot-tested.

3.5. Data collection and analysis

The online questionnaire utilized for the purposes of this study was built through Qualtrics and it was subsequently distributed through Amazon Mechanical Turk (AMT) over the first week of July 2016. The target population for the study was composed of tourists who had previously visited a beach/coastal destination in Florida. Respondents who agreed to participate in the study were granted \$1 as a compensation to take and return the survey. At the end of the data collection period, a total of 509 responses were collected.

After completing the data screening and preparation process (see Appendix for preliminary data collection and data screening and preparation details), 432 surveys were retained for the analysis. Both descriptive and inferential analyses were conducted with the aid of SPSS version 21.0. The Bowker-McNemar's test of internal symmetry was utilized to test the relationship between tourists' visitation intentions to a climate change impacted destination and the existence of adaptation measures at the destination.

4. Results

4.1. Demographics/profile of respondents

The demographic profile of respondents showed a balanced sample in terms of gender, an age distribution skewed toward the younger end, and a fairly high education level. The median annual income was lower than \$50,000, with the sample mostly divided into respondents who were single and respondents who were married or in a domestic partnership. In terms of ethnicity and residence, the majority of respondents were white and lived in the United States. About half of the sample indicated their political views were closer to Democrat, another good share was closer to Independent, and the smaller share were closer to Republican. In terms of spiritual beliefs, the sample was mostly divided into Christians and atheists or agnostics.

4.2. Characteristics of Florida beach/coastal destination visits

During their last visit, which in the majority of cases occurred over the last three years, respondents visited the whole range of Florida coastal regions, although there was a greater concentration toward the Southeast (e.g. Miami Beach) and the Central East (e.g. Daytona Beach). The vast majority of respondents traveled mainly for leisure purposes and for visiting friends and relative, in half of the cases without children. The activities enjoyed by the majority of respondents included walking on the beach, relaxing and sunbathing on the beach and swimming, followed by activities entailing the observation of marine wildlife, fishing, and water sports (Table 1).

Table 1
Characteristics of destination visit.

Variable (N = 432)	Frequency	Percentage
Main purpose of the trip		
Business/Professional	16	3.7
Convention/Conference/Trade show	3	0.7
Leisure/Recreation/Holidays/Sightseeing	309	71.5
Visit friends/Relatives	91	21.1
Government affairs/Military	2	0.5
Study/Teaching	1	0.2
Religion/Pilgrimages	1	0.2
Health treatment	1	0.2
Other	8	1.9
Travel companionship		
Traveling alone	38	8.8
Spouse/partner	126	29.2
Family/Relatives	183	42.4
Friend(s)	80	18.5
Business associate(s)	3	0.7
Tour group	2	0.5
Destination visited		
Northwest (Pensacola, Destin/Fort Walton, Panama City)	71	16.4
Central West (Clearwater, St. Pete, Sarasota, Tampa)	73	16.9
Southwest (Fort Myers, Naples, Marco Island, Sanibel)	31	7.2
Northeast (Amelia Island, Jacksonville, St. Augustine)	20	4.6
Central East (Daytona, New Smyrna, Cocoa, Melbourne, Vero)	89	20.6
Southeast (West Palm Beach, Fort Lauderdale, Miami)	124	28.7
Florida Keys (Key West, other keys)	24	5.6
Activities on the beach/coast		
Beach relaxation/sunbathing	377	87.3
Walking on the beach	395	91.4
Swimming	321	74.3
Snorkeling	43	10.0
Diving	35	8.1
Jet skiing	35	8.1
Surfing/windsurfing	22	5.1
Fishing	66	15.3
Biking/cycling	51	11.8
Horseback riding	8	1.9
Wildlife observation	86	19.9
Other	16	3.7

4.3. Relative importance of beach/coastal destination environmental attributes for destination selection

In an attempt to examine the relative importance tourists assign to different environmental attributes, respondents were asked to rate the importance of a set of environmental attributes in selecting the beach/coastal destination they visited in Florida on a Likert scale from 1 to 7. The mean values, shown in Table 2, indicate that on average the environmental attributes considered most important were ample sunshine ($M = 5.69$, $SD = 1.16$) and other variables related to their comfort at the beach, such as comfortable air temperature ($M = 5.37$, $SD = 1.31$). On the other hand, the majority of respondents did not consider the attributes related to marine wildlife a priority for selecting the tourist destination.

4.4. Preferences for weather and climate conditions for a beach/coastal vacation in Florida

In the next survey section, respondents were asked to assess their preferences for weather and climate conditions for a beach/coastal vacation in Florida. To determine the range of optimal climate for

Table 2
Relative importance of destination environmental attributes for destination selection.

Environmental attributes (N = 432)	Mean Value	SD Value
Ample Sunshine	5.69	1.16
Sand quality	5.54	1.31
Beach size	5.44	1.27
Comfortable water temperature	5.41	1.39
Comfortable air temperature	5.37	1.31
Water clarity	5.33	1.46
Lack of tropical diseases	5.02	1.80
No vaccination requirements	4.49	1.92
Existence of Marine wildlife	4.03	1.83
Existence of wetlands flora and fauna	3.63	1.78
Flat landscape	3.47	1.65
Coral health	3.42	1.80
Bird diversity	3.29	1.75
Fish abundance	3.28	1.84
Coral diversity	3.28	1.70
Fish diversity	3.18	1.72
Climate	5.49	1.03

Table 3
Respondents' preferences for weather conditions.

Weather conditions (N = 432)	Mean Value	SD Value
Air temperature conditions °F (°C)		
Ideal temperature	82.01 (27.78)	6.59 (3.66)
Tolerably hot temperature	89.84 (32.13)	7.16 (3.97)
Unacceptably hot temperature	98.09 (36.72)	9.04 (5.02)
Rainfall duration conditions hours		
Ideal daily rainfall duration	0.08	1.22
Tolerable daily rainfall duration	1.50	1.29
Unacceptable daily rainfall duration	3.73	1.70
Cloud cover conditions %		
Ideal cloud cover	29.01	24.41
Tolerable cloud cover	49.12	19.55
Unacceptable cloud cover	69.85	29.35
Wind conditions mph (km/h)		
Ideal wind strength	12.93 (20.80)	8.37 (13.47)
Tolerable wind strength	22.03 (35.45)	9.14 (14.71)
Unacceptable wind strength	35.39 (56.95)	13.38 (21.54)

beach/coastal tourism and explore the thresholds within the continuum from “ideal” and “unacceptable”, four different weather variables were examined – sunshine, temperature, rain and wind – and the relative results are reported in Table 3. Firstly, to assess their preferences for air temperature, respondents were asked to indicate their ideal, tolerably hot and unacceptably hot air temperature in °F (correspondent values in °C are also reported) for a beach/coastal vacation in Florida. Results indicated that an average ideal temperature of about 82 °F (27.8 °C) ($M = 82.01$, $SD = 6.59$), a tolerably hot temperature of about 90 °F (32.1 °C) ($M = 89.84$, $SD = 7.16$), and an unacceptably hot air temperature of about 98 °F (36.7 °C) ($M = 98.09$, $SD = 9.04$).

On a second set of questions, respondents were asked to indicate their ideal, tolerable and unacceptable daily rain conditions for a beach/coastal vacation in Florida. The results showed that, on average, less than an hour ($M = 0.078$, $SD = 1.22$) of rain is considered ideal, between 1 and 2 h ($M = 1.50$, $SD = 1.29$) of rain are considered tolerable, whereas more than 3 h ($M = 3.73$, $SD = 1.70$) are considered unacceptable. Thereafter, to assess their preferences for sky conditions, respondents were asked to indicate their ideal, tolerable and unacceptable percentage of cloud cover for a beach/coastal vacation in Florida. The findings showed that respondents' ideal cloud cover conditions are about 29% ($M = 29.01$, $SD = 24.41$), they tolerate about 50% ($M = 49.12$, $SD = 19.55$), whereas they consider about 70%

Table 4
Responses to different climate change impacts in terms of visitation intentions.

Climate change impacts (N = 432)	I would choose the same destination (%)	I would choose the same destination but different dates (%)	I would choose a different destination (%)
Tropical diseases become more widespread	8.8	14.6	76.6
Streets are frequently flooded as a result of rain or tidal surge	10.2	33.1	56.7
Beaches largely disappear	11.6	14.4	74.1
Storms intensify throughout the year	13	40.5	46.5
Temperature becomes uncomfortably hot to me	18.5	65	16.4
Rainfall daily duration becomes uncomfortable to me	21.1	57.4	21.5
Wind strength becomes uncomfortable to me	26.4	53.9	19.7
Marine wildlife largely disappears	31.9	21.8	46.6
Corals severely bleach	35.6	21.5	42.8
Cloud cover becomes uncomfortable to me	39.8	45.8	14.4

($M = 69.85$, $SD = 24.85$) of cloud cover as unacceptable for a beach vacation in Florida.

On a final set of questions, respondents were asked to select their ideal, tolerable and unacceptable wind conditions in mph (correspondent values in km/h are also reported) for the same vacation. Results showed that, on average, the ideal wind conditions are a moderate wind ($M = 12.93$, $SD = 8.37$), a strong wind ($M = 22.03$, $SD = 9.14$) is considered tolerable, while a very strong wind is considered unacceptable ($M = 35.39$, $SD = 13.38$).

4.5. Responses to climate change impacts in terms of visitation intentions

After assessing respondents' preferences for weather and climate conditions on a beach/coastal vacation in Florida, responses to climate change impacts in Florida's coastal destinations in terms of visitation intentions were investigated. As depicted in Table 4, responses varied depending on what impact was considered.

When asked what their likely reaction to changed climatic and environmental conditions like those described above would be overall, only 18.1% of the respondents indicated that they would likely choose the same destination, whereas 43.8% of the respondents indicated that they will switch dates of visitation, and 38.2% would choose a different destination.

Respondents who indicated they would choose the same destination were asked to explain why. Those who indicated they would choose the same destination but different dates were asked to specify when they would visit the destination instead (season or month of the year), in order to gather further understanding of possible shifts in seasonality in terms of changed time of visitation. Lastly, those who responded they would choose a different destination were asked to detail what destination they would choose instead (any destination in any state or country), in order to gather a further understanding of possible shifts in visitation in terms of place. The most common reason respondents gave to explain why they would choose the same destination related to the fact of living or having family in the area. Other respondents reported that they would still choose the same destination provided that the changes in climate are not extreme. Respondents who indicated a different season or month of the year for visiting the destination tended to indicate the spring, winter or fall months, rather than the summer months. Those who indicated they would choose to visit a different destination mentioned mostly California, North and South Carolina, and inland regions of Florida such as Orlando and the theme parks.

4.6. Respondents' preferences for adaptation measures and visitation intentions

Since the final decision whether to travel to a destination or not is made by individual tourists, respondents were asked to rate the level of desirability of the adaptation measures listed on Table 5 for them to feel comfortable enough to visit the same destination in Florida again, in

case of changed climatic and environmental conditions. The preferred adaptation options appear to be those that would reduce prices ($M = 5.61$, $SD = 1.17$) in order to account for the diminished appeal of the area, and those that protect coastal habitat and beaches from erosion and coastal areas from inundation. On the other hand, indoor activities ($M = 4.74$, $SD = 1.22$) and built attraction to replace natural attraction ($M = 4.09$, $SD = 1.67$) are not particularly desirable to respondents.

After rating the desirability of the potential adaptation measures, respondents were asked what their reaction would be, in terms of visitation intentions, if in spite of changed climatic and environmental conditions, the adaptation options that were desirable to them were to be implemented at the last destination they visited in Florida. With the prospect of adaptation measures being implemented at the destination level, more than half (56.7%) of respondents would choose to visit the same destination, 33.3% would visit on different dates, and a remaining 10% would choose a different destination.

4.7. Inferential analysis and test of hypothesis: adaptation measures and changes in tourists' visitation intentions

To test the relationship between tourists' visitation intentions to a climate change impacted destination and the existence of adaptation measures at the destination, this study utilized the Bowker-McNemar's test of internal symmetry. As shown in Table 6, the Bowker-McNemar's Test is significant at the $p < .001$. This indicates that there was a significant change in the proportion of tourists' visitation intentions if climate change adaptation measures were implemented at the destination, in comparison with the scenario in which the destination was impacted by climate change and adaptation measures were not existent. The hypothesis was supported, suggesting that the introduction of adaptation measures at the destination would be able to mitigate the potential geographical and seasonal shifts in demand, according to the respondents' stated visitation intentions.

5. Discussion

Many coastal tourism destinations depend on favorable climatic conditions, such as ample sunshine, no precipitation and no wind. The study findings confirm that climate is a key factor considered by tourists, either consciously or subconsciously, during travel planning (Scott et al., 2008). Those surveyed in this study considered climate conditions very important in selecting the beach/coastal destinations visited in Florida. Ample sunshine, sand and water quality, beach size, and comfortable water and air temperature were considered the most important environmental attributes in determining their destination choice. In general, a critical element in leisure travel demand is the degree of comfort (or discomfort) experienced at the tourism destination. As stressed by Mather et al. (2005), the comfort experienced by tourists is also influenced by other elements such as disease risk,

Table 5
Respondents' preferences for adaptation measures at the destination.

Adaptation measures (N = 432)	Mean Value	SD Value
Prices of lodging and other products and services are reduced	5.61	1.17
Marine protected areas (sanctuaries) for coastal habitat preservation are created	5.48	1.28
Preservation plans of wetlands flora and fauna are implemented	5.41	1.24
Beach nourishment is implemented to deal with beach shrinking	5.35	1.14
Response plans for coral bleaching are implemented	5.25	1.32
Sea walls defenses and breakwaters are built to avoid beaches/coasts erosion	5.18	1.24
Pumps that draw floodwater from the flooded streets are installed	5.12	1.18
Information about changes in climatic and environmental conditions is provided to visitors	5.00	1.16
Street level is raised to cope with flooding	4.94	1.21
Free transportation to the beach with shuttle buses is provided to visitors	4.91	1.28
Tourism resorts and infrastructure are moved further back from eroding coasts	4.83	1.34
Fans and air conditioning are placed outdoor	4.80	1.48
More indoor leisure-time activities are offered to visitors	4.74	1.22
More built attractions are introduced to replace natural attractions	4.09	1.67

Table 6
Differences in visitation intentions to a climate change impacted destination in existence versus non existence of adaptation measures at the destination.

	Same Destination	Different Dates/ Same Destination	Different Destination	Total
Visitation Intentions to Climate Change	78	189	165	432
Impacted Destination	18.1%	43.8%	38.2%	100.0%
Visitation Intentions in existence of Adaptation	245	144	43	432
Measures at the destination	56.7%	33.3%	10.0%	100.0%

prolonged rainfall and changes in extremes. This study confirms, as previously found by [Uyarra et al. \(2005\)](#) for Bonaire and Barbados in the Caribbean, that low health risk, along with clear waters and warm temperatures were the among the most important criteria for selecting the visited destination.

Despite assigning relatively lower importance to biodiversity attributes (e.g. marine wildlife, wetlands flora and fauna, coral and fish abundance and diversity) as factors for choosing the destination, more than 40% of respondents stated they would choose a different destination in a scenario in which 'corals severely bleach' and 'marine wildlife largely disappear'. Also, habitat protection and restoration measures, namely 'marine protected areas (sanctuaries) for coastal habitat preservation are created', 'preservation plans of wetlands flora and fauna are implemented', and 'response plans for coral bleaching are implemented', were among the preferred adaptation measures selected. The reason for this apparent incongruity might lie in the fact that, while surveyed respondents attach high importance at beach comfort related factors, at the same time they seem to recognize the importance of marine wildlife and coastal habitat for the long-term preservation of their visited destination.

On the other hand, 'lack of tropical diseases' has been assigned high importance for choosing the visited destination in Florida, with 76% of respondents stating that they would not choose the same destination if 'tropical diseases become more widespread'. The fact that a plan for decreasing risk of tropical diseases was not included in this study's list of potential adaptation measures is because the literature does not report it as a climate change adaptation measure yet. Being a relatively new threat for Florida, the state has not yet developed a formal adaptation plan. Since there is no specific antiviral medication for treatment of a Dengue, Zika and similar tropical diseases, tourism and health governmental bodies such as Visit Florida and Florida Health are currently only recommending tourists to decrease the risk by taking preventive action (e.g. washing hands often, getting vaccines before the vacation, and preventing insect bites through the use of appropriate clothing and insect repellent). As climate change impacts become more severe, and the risk of tropical diseases expands, a formal adaptation strategy will need to be in place, for Florida to be able to maintain its touristic attractiveness.

The preferences for weather and climate conditions stated by the tourists in this research confirm the results obtained by previous stated preferences studies carried out in different coastal destinations in Europe and in the Caribbean ([Morgan et al., 2000](#); [Gómez-Martín, 2006](#); [Scott et al., 2008](#); [Moreno, 2010](#); [Rutty & Scott, 2010, 2013, 2016](#)). For instance, [Morgan et al. \(2000\)](#) in an in-situ survey in Wales, Turkey and Malta found that no rain, followed by presence of sunshine, was considered the most important factor for a beach vacation. The present study also confirms the results obtained by [Gómez-Martín \(2006\)](#) in an in-situ study conducted among tourists in Catalonia (Spain) during summer. The tourists surveyed in Spain expressed a strong demand for sunshine, affirming that less than 1 h of rain was acceptable but more than 3 h of rain would "totally ruin" (p. 80) their experience. Comparable to what has been found in this study, in an ex-situ study [Scott et al. \(2008\)](#) found that a temperature of 27 °C, a light breeze and 25% cloud cover was seen as ideal for a beach vacation, with results varying based on the respondents' nationality. Similarly, tourists surveyed by [Moreno \(2010\)](#) while waiting for their flight to the Mediterranean, indicated an ideal air temperature of 28 °C for beach tourism. Analogously, another ex-situ study by [Rutty and Scott \(2010\)](#), found ideal temperatures being between 27° and 32 °C, with more than 37 °C identified by tourists as unacceptably hot. In a following in situ study in the Caribbean, [Rutty and Scott \(2013\)](#) found that tourists seemed to prefer daily rain conditions of 15 min or less, with 2 h of rain considered unacceptable. Also, comparable to the present study, 25% cloud cover was deemed ideal while more than 75% cloud cover considered unacceptable. The comparison with the studies conducted in other countries on tourists' stated preferences suggest that ideal and unacceptable climate conditions for beach tourism are similar in the areas studied so far. However, preferences slightly vary based on the sample under analysis, such as respondents' nationality or destination visited. Also, the holiday/travel circumstances, such as domestic or international travel, or whether the samples are surveyed in situ or ex situ, may influence their climatic preferences and thresholds.

Although temperatures in Florida already exceed the 'unacceptable' 98 °F (36.7 °C) threshold during the summer months, according to IPCC's scenarios, climate conditions in Florida are expected to change in the decades to come, with increasing air temperatures and more

frequent storms. As indicated by a large percentage of the surveyed tourists, if weather conditions become unacceptable to them, their visitation intentions would change towards visiting on a different month or season of the year. These findings reflect tourists' perceptions, a very important factor to account for in the attempt to understand whether climate change will lead to changing tourist flows, especially in already warm destinations (Gössling & Hall, 2006). While in a scenario of changed weather-related conditions, tourists indicated that they would still visit, albeit on a different month or season of the year, in a scenario of increased storms, health and safety risks and impacted landscapes and infrastructures. For instance, in a scenario of beach disappearance and widespread tropical disease, the vast majority of tourists surveyed stated they would choose a different destination. The results of this study showed that the majority of respondents choose to visit Florida because they feel comfortable, they feel safe, and they enjoy the coastal flora and fauna. The disappearance of those attributes would make them not want to visit the same destination again, in most cases.

These responses seem to confirm the findings by Moreno (2010), in which tourists were asked what their reaction would be if, before reserving their vacation, they knew that a list potential impacts of climate change would happen throughout at least half of their beach vacation time. Consistent to what was found in this study, 39% of tourists indicated they would 'choose a different destination', another 37% would 'not change destination', and the remaining 24% would 'choose the same destination but different dates'. Similarly, Uyarra et al. (2005) found that the intentions of tourists to repeat their visit to Bonaire and Barbados was strongly connected to the conditions of their favorite environmental attributes (e.g. marine wildlife such as coral, and beach features). As a result, more than 80% of respondents reported that they would not be willing to visit their vacation island again for the same price if their favorite destination attractions were negatively impacted by climate change - namely, if coral reef were severely bleached due to increased sea temperatures (in Bonaire) and if beaches mostly disappeared because of sea level rise (in Barbados).

In the open-ended follow-up question connected to each of the three visitation intentions options, the most common reason tourists gave to explain why they would choose the same destination, in spite of the changed conditions described, and referred to the fact of living or having family in the area. If tourism declined, then fewer people would live in the area, so fewer people would go to visit them, and tourism would go into a spiral of decline. Other tourists affirmed that they would still choose the same destination provided that the changes in climate are not extreme. With the large majority of the population in Florida being concentrated in coastal areas, the impacts of climate change Florida will be particularly felt by tourists and locals alike. Tourists who indicated they would visit on a different season or month of the year tended to indicate the spring, winter or fall months, rather than the summer months (in which most surveyed tourists' visits have occurred). Florida receives constant tourist flow throughout the year, thanks to its subtropical weather. However, the summer months are still the most popular months for traveling, coinciding with school breaks and annual holiday leaves in the United States and many other countries worldwide. When considering this factor, it becomes difficult to predict how tourists' visitation intentions would correspond to actual behavior once the impacts of climate change will be fully visible. Among the destinations indicated by those tourists who would choose to visit a different destination in the described scenario, the most nominated were California, North and South Carolina, and inland regions of Florida such as Orlando and the theme parks.

The introduction of adaptation measures at the destination seems to be particularly beneficial as a strategy to mitigate shifts in tourism demand. The findings suggest, in fact, that introducing adaptation measures to cope with the impacts of climate change would positively impact tourists' visitation intentions. The adaptation measures preferred by the surveyed tourists appeared to be those that would reduce

prices in order to account for the diminished appeal of the area, and those that protect coastal habitat and beaches from erosion and coastal areas from inundation. On the other hand, indoor activities and built attractions to replace natural attractions were not considered particularly desirable. These results were consistent with what Buzinde et al. (2010) found in Playacar, and confirm how the existence of adaptation measures implemented at the destination is appreciated, when tourists are informed about how adaptation efforts may benefit the destination and ultimately their own experience.

In Florida, some adaptation measures would work better than others. For instance, although beach nourishment seemed to work well as adaptation strategy in Playacar (Moreno, 2010), it entails high economic and environmental costs. Counteracting the effects of sea level rise in Florida in 2060 would require \$2.4 billion for a one-time beach nourishment only. Considering the fact that nourished beaches erode two to ten times more quickly than others, re-nourishment of beaches would need to take place every six to ten years, at a very high cost (Stanton & Ackerman, 2007). Additionally, from an ecological perspective, the material utilized for beach nourishment destroys the existing ecosystem of fauna and flora. Current adaptation efforts in Florida include the utilization of pumps installed to draw the water from the flooded streets and push it away. This type of adaptation effort has so far been a temporary and costly remedy to counteract flooding events. For example, In Miami Beach, where the streets are already flooding during storms and high tides, adaptation has cost the city about \$400 million to install the water pump system (Sutter, 2016). Additionally, Florida cities are currently elevating roads and raising and restoring the already existing seawalls. However, the porous nature of Florida's geology (Parkinson & Donahue, 2010) precludes the effectiveness of sea wall defenses, since the water still leaks in through the porous limestone most of South Florida sits on underneath the seawalls (Bagley, 2016).

Other adaptation options that would be more successful in protecting the physical environment and maintaining touristic attractiveness of Florida include the enhancement and preservation of natural defenses (e.g. the replanting of mangrove swamps or rising the land level of low-lying areas). Building tourism infrastructure and resorts further back from the coast is another possible option to adapt to the changed conditions. Also, having a response plan to deal with the degradation of coral reefs is indispensable to protect this vital resource not only for tourism income but also for the ecosystem. Additionally, the development of alternative marketing strategies can be used to cope with an expanding or a diminishing market and to adapt to changes in the seasonality of tourist arrivals. However, the fact that a part of the tourists surveyed in the present study would still switch their time of visitation or choose to visit a different destination despite the existence of adaptation measures, suggest that adaptation is not always sufficient to appeal to tourists in the occurrence of climate change impacts. These findings support the point that, of all the stakeholders involved in the tourism system, it is the tourist that has the greatest capacity to adapt to the impacts of climate change (Becken & Hay, 2012; Jopp et al., 2010; Scott et al., 2008). This offers the opportunity for coastal destinations and hospitality businesses statewide to take tourists' perspectives into consideration and use that to build their case to request state and federal government funding and support for the implementation of adaptation measures which could mitigate shifts in tourism demand. Understanding which adaptation measures would make tourists feel comfortable and still visit a destination even in a scenario of climate change is important in an attempt to understand where a destination should concentrate its efforts to cope with climate change and make them visible to the tourists.

6. Conclusion

Despite the urgency for tourism destinations to adapt to climate change, prior to this study, no research had previously examined the

perspective of the tourists with regard to how coastal destinations have to adapt if tourists are to feel comfortable despite the impacts of climate change. The examination of the tourist perspective attempted to further our knowledge of how potential seasonal and geographic shifts in tourism demand could be mitigated by the implementation of adaptation measures at the destination level.

The results of this study suggest that tourists who visited Florida's coastal regions attach high importance to climatic conditions and environmental features of the visited destination, such as the presence of ample sunshine and other attributes related to their comfort on the beach. Unlike other destinations, in which tourists enjoy man-made attractions, tourists are attracted to the coasts of Florida mainly for their environmental features. Hence, most tourists would not likely choose to visit the same destination again if the environmental attributes that made them choose that destination disappeared. Some of the responses worthy of attention include a large share of tourists stating they would likely choose different dates to visit the destination in a scenario in which the temperature become uncomfortably hot. Also, the majority of respondents stated they would choose a different destination in the event beaches disappear or tropical diseases become more widespread. However, the findings also showed that those tourists who would switch destination in a scenario of climate change would reconsider their intention if their preferred adaptation measures were in place. The results showed that respondents' preferred adaptation options appear to be those that would reduce prices in order to account for the diminished appeal of the area and those that protect coastal habitat and beaches from erosion and coastal areas from inundation. In contrast, indoor activities and built attraction to replace natural attractions were not particularly desirable in the eye of respondents. This should be regarded as an opportunity for coastal destinations across Florida to ensure that action is taken to protect coastal resources and enhance safety. Decisive action to address climate change is thus recommended now at various decision-making levels, to avoid losing a large share of visitors in the future. Moreover, paying attention to tourists' preferences for adaptation measures to be implemented at the destination level is essential for policy makers and practitioners in order to make informed decisions about what areas constitute a priority to focus their adaptation efforts.

APPENDIX

Preliminary data collection

The survey instrument was first pilot-tested with a sample composed of 149 students enrolled at a university in Florida. The aim of the pilot study was to receive feedback regarding the clarity and understandability of the instruments and to gather a preliminary understanding of the distribution and structure of the data. The participants in the pilot-test were a nonprobability convenience sample to conform to the main study's sampling method. Once the pilot-test was completed and feedback suggested by the respondents implemented, the collection of data for the main study was launched. Data for the main study was collected using Amazon's Mechanical Turk (AMT) panels over the first week of July 2016. The target population for the study was composed of tourists who had previously visited a beach/coastal destination in Florida. Respondents who agreed to participate in the study were granted \$1 as a compensation to take and return the survey. At the end of the data collection period, a total of 509 responses were collected.

Data Preparation

After data were collected, they were analyzed with the aid of SPSS version 21.0. As stated above, the initial database consisted of 509 responses. However, 53 of them were started and then dropped because the participants did not satisfy the requirements for completing the survey (i.e. having visited a beach/coastal destination in Florida).

Hence, a total of 456 complete surveys were collected. The data gathered from the completed surveys were subject to initial screening. First, the data were screened to detect any deviations from normality. Next, missing data and outliers were checked. While significant outliers were not detected, missing and incomplete values resulted in exclusion from the data analysis. As a consequence of data screening, 24 surveys were eliminated from the analysis because the visited destination indicated from respondents was either not an actual coastal destination (e.g. Orlando) or there was no indication of a specific destination (e.g. I don't remember, no idea). At the end of the data preparation process, 432 surveys were retained for the analysis.

References

- Bagley, K. (2016). *Rising seas pull Fort Lauderdale, Florida's building boomtown, toward a bust*. Inside Climate News. 3 March, available at: <https://insideclimatenews.org/news/01032016/ft-lauderdale-climate-change-global-warming-rising-sea-level>, Accessed date: 20 December 2017.
- Becken, S. (2004). How tourists and tourism experts perceive climate change and carbon-offsetting schemes. *Journal of Sustainable Tourism*, 12(4), 332–345.
- Becken, S., & Hay, J. E. (2007). *Tourism and climate change: Risks and opportunities. Vol. 1. Multilingual Matters*.
- Becken, S., & Hay, J. E. (2012). *Climate change and tourism: From policy to practice*. Routledge.
- Becker, S. (2000). Bioclimatological rating of cities and resorts in South Africa according to the climate index. *International Journal of Climatology*, 20(12), 1403–1414.
- Bigano, A., Hamilton, J. M., & Tol, R. S. (2006). The impact of climate on holiday destination choice. *Climatic Change*, 76(3–4), 389–406.
- Borisova, T., Breuer, N., & Carriker, R. (2008). *Economic impacts of climate change on Florida: Estimates from two Studies I*. EDIS and University of Florida-IFAS.
- Braun, O. L., Lohmann, M., Maksimovic, O., Meyer, M., Merkovic, A., Messerschmidt, E., et al. (1999). Potential impact of climate change effects on preferences for tourism destinations. A psychological pilot study. *Climate Research*, 11(3), 247–254.
- Buzinde, C. N., Manuel-Navarrete, D., Yoo, E. E., & Morais, D. (2010). Tourists' perceptions in a climate of change: Eroding destinations. *Annals of Tourism Research*, 37(2), 333–354.
- Cook, C., Heath, F., & Thompson, R. L. (2000). A meta-analysis of response rates in web-or internet-based surveys. *Educational and Psychological Measurement*, 60(6), 821–836.
- Coombes, E. G., & Jones, A. P. (2010). Assessing the impact of climate change on visitor behaviour and habitat use at the coast: A UK case study. *Global Environmental Change*, 20(2), 303–313.
- De Freitas, C. R. (1990). Recreation climate assessment. *International Journal of Climatology*, 10(1), 89–103.
- De Freitas, C. R. (2005). The climate-tourism relationship and its relevance to climate change impact assessments. In C. M. Hall, & J. E. Higham (Vol. Eds.), *Tourism, recreation, and climate change. Vol. 22. Tourism, recreation, and climate change* (pp. 29–43). (Channel View Publications).
- El-Raey, M., Dewidar, K. R., & El-Hattab, M. (1999). Adaptation to the impacts of sea level rise in Egypt. *Mitigation and Adaptation Strategies for Global Change*, 4(3–4), 343–361.
- Florida Majors (2016, Jan. 21). *Open letter from Florida mayors to senator marco rubio*. Available at: https://s3.amazonaws.com/s3.climatetruth.org/images/FL_Mayors_Climate_Letter_to_Senator_Rubio.pdf.
- Francia, C., & Juhasz, F. (1993). *The lagoon of Venice, Italy. In coastal zone management: Selected case studies* (pp. 109–134). Paris, France: Organisation for Economic Co-operation and Development (OECD).
- Gómez-Martín, B. (2004). An evaluation of the tourist potential of the climate in Catalonia (Spain): A regional study. *Geografiska Annaler - Series A: Physical Geography*, 249–264.
- Gómez-Martín, M. B. (2006). Climate potential and tourist demand in Catalonia (Spain) during the summer season. *Climate Research*, 32(1), 75.
- Gössling, S., Bredberg, M., Randow, A., Sandström, E., & Svensson, P. (2006). Tourist perceptions of climate change: A study of international tourists in Zanzibar. *Current Issues in Tourism*, 9(4–5), 419–435.
- Gössling, S., & Hall, C. M. (2006). Uncertainties in predicting tourist flows under scenarios of climate change. *Climatic Change*, 79(3–4), 163–173.
- Gössling, S., & Hall, C. M. (2006a). Uncertainties in predicting travel flows: Common ground and research needs. A reply to Tol et al. *Climatic Change*, 79(3–4), 181–183.
- Gössling, S., Scott, D., Hall, C. M., Ceron, J. P., & Dubois, G. (2012). Consumer behaviour and demand response of tourists to climate change. *Annals of Tourism Research*, 39(1), 36–58.
- Harrington, J., & Walton, T. L. (2008). *Climate change in coastal areas in Florida: Sea level rise estimation and economic analysis to year 2080*. Tallahassee, FL: Florida State University.
- Hartmann, D. L., Klein Tank, A. M. G., Rusticucci, M., Alexander, L. V., Brönnimann, S., Charabi, Y., et al. (2013). Observations: Atmosphere and surface. In T. F. Stocker, D. Qin, G. K. Plattner, M. Tignor, S. K. Allen, & J. Boschung, (Eds.), *Climate change 2013: The physical science basis. Contribution of working group I to the fifth assessment report of the intergovernmental panel on climate change* (pp.159–254). Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press.
- Hauer, M. E., Evans, J. M., & Mishra, D. R. (2016). Millions projected to be at risk from sea-level rise in the continental United States. *Nature Climate Change*, 1–9.

- Jones, A. L., & Phillips, M. R. (Eds.). (2009). *Disappearing destinations: Climate change and future challenges for coastal tourism*. CABI.
- Jopp, R., DeLacy, T., & Mair, J. (2010). Developing a framework for regional destination adaptation to climate change. *Current Issues in Tourism*, 13(6), 591–605.
- Lise, W., & Tol, R. S. (2002). Impact of climate on tourist demand. *Climatic Change*, 55(4), 429–449.
- Maddison, D. (2001). In search of warmer climates? The impact of climate change on flows of British tourists. *Climatic Change*, 49(1–2), 193–208.
- Mansfeld, Y., Freundlich, A., & Kutiel, H. (2007). The relationship between weather conditions and tourists' perception of comfort: The case of the winter sun resort of Eilat. In B. Amelung, K. Blazejczyk, & A. Matzarakis (Eds.). *Climate change and tourism –assessment and coping strategies* (pp. 116–139). Maastricht – Warsaw – Freiburg.
- Mather, S., Viner, D., & Todd, G. (2005). Climate and policy changes: Their implications for international tourism flows. In C. M. Hall, & J. E. Higham (Vol. Eds.), *Tourism, recreation and climate change*. Vol. 22. *Tourism, recreation and climate change* (pp. 63–85). (Channel View Publications).
- Moreno, A. (2010). Mediterranean tourism and climate (change): A survey-based study. *Tourism and Hospitality Planning & Development*, 7(3), 253–265.
- Moreno, A., & Becken, S. (2009). A climate change vulnerability assessment methodology for coastal tourism. *Journal of Sustainable Tourism*, 17(4), 473–488.
- Morgan, R., Gatell, E., Junyent, R., Micallef, A., Özhan, E., & Williams, A. T. (2000). An improved user-based beach climate index. *Journal of Coastal Conservation*, 6(1), 41–50.
- Nicholls, R. J., Marinova, N., Lowe, J. A., Brown, S., Vellinga, P., De Gusmao, D., et al. (2011). Sea-level rise and its possible impacts given a 'beyond 4°C world' in the twenty-first century. *Philosophical Transactions of the Royal Society of London: Mathematical, Physical and Engineering Sciences*, 369(1934), 161–181.
- Noss, R. F. (2011). Between the devil and the deep blue sea: Florida's unenviable position with respect to sea level rise. *Climatic Change*, 107(1–2), 1–16.
- Parkinson, R. W., & Donahue, J. F. (2010). Bursting the bubble of doom and adapting to sea-level rise. *Shorelines*. March, available at: https://www.researchgate.net/publication/267399855_Bursting_the_Bubble_of_Doom_and_Adapting_to_Sea_Level_Rise, Accessed date: 20 December 2017.
- Phillips, M. R., & Jones, A. L. (2006). Erosion and tourism infrastructure in the coastal zone: Problems, consequences and management. *Tourism Management*, 27(3), 517–524.
- Pontee, N. (2013). Defining coastal squeeze: A discussion. *Ocean & Coastal Management*, 84, 204–207.
- Prideaux, B., Coghlan, A., & McNamara, K. (2010). Assessing tourists' perceptions of climate change on mountain landscapes. *Tourism Recreation Research*, 35(2), 187–200.
- Repetto, R. (2012). *Economic and environmental impacts of climate change in Florida*. New York: Demos.
- Rutty, M., & Scott, D. (2010). Will the Mediterranean become "too hot" for tourism? A reassessment. *Tourism and Hospitality Planning & Development*, 7(3), 267–281.
- Rutty, M., & Scott, D. (2013). Differential climate preferences of international beach tourists. *Climate Research*, 57(3), 259–269.
- Rutty, M., & Scott, D. (2016). Comparison of climate preferences for domestic and international beach holidays: A case study of Canadian travelers. *Atmosphere*, 7(2), 30.
- Schleupner, C. (2008). Evaluation of coastal squeeze and its consequences for the Caribbean island Martinique. *Ocean & Coastal Management*, 51(5), 383–390.
- Scott, D., Amelung, B., Becken, S., Ceron, J. P., Dubois, G., Gössling, S., et al. (2008a). *Climate change and tourism: Responding to global challenges*. Madrid: United Nations World Tourism Organization.
- Scott, D., Gössling, S., & De Freitas, C. R. (2008b). Preferred climates for tourism: Case studies from Canada, New Zealand and Sweden. *Climate Research*, 38(1), 61–73.
- Scott, D., Gössling, S., & Hall, M. (2012a). International tourism and climate change. *WIREs Climate Change*, 3, 213–232.
- Scott, D., Hall, C. M., & Gössling, S. (2012b). *Tourism and climate change: Impacts, adaptation and mitigation*. Routledge.
- Scott, D., Simpson, M. C., & Sim, R. (2012c). The vulnerability of Caribbean coastal tourism to scenarios of climate change related sea level rise. *Journal of Sustainable Tourism*, 20(6), 883–898.
- Simpson, M., Scott, D., & Trotz, U. (2011). *Climate change's impact on the Caribbean's ability to sustain tourism, natural assets and livelihoods*. Inter-American Development Bank (IDB) Environmental Safeguards Unit Technical notes No. IDB-TN-238.
- Stanton, E., & Ackerman, F. (2007). Florida and climate change. *The costs of inaction*. Tufts University.
- Sutter, J. D. (2016). *Can Miami Beach survive climate change?* CNN. 29 February, available at: <http://edition.cnn.com/2016/02/29/opinions/sutter-miami-beach-survive-climate/index.html>, Accessed date: 20 December 2017.
- Uyarra, M. C., Cote, I. M., Gill, J. A., Tinch, R. R., Viner, D., & Watkinson, A. R. (2005). Island-specific preferences of tourists for environmental features: Implications of climate change for tourism-dependent states. *Environmental Conservation*, 32(01), 11–19.



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